

MthSc 440/640 Problem Set #2

Due 1/27/12

1. Consider the LP given by

$$\begin{aligned} \max z &= 4x_1 + 3x_2 \\ \text{s.t.} \quad &7x_1 + 3x_2 \leq 21 \\ &2x_1 + 3x_2 \leq 12 \\ &x_1 \geq 0, x_2 \geq 0 \end{aligned}$$

- (a) Carefully graph the feasible region of this LP and identify each of the corner points using the letters A, B, C, ...
- (b) Write the functional constraints in standard equality form $A\mathbf{x} = \mathbf{b}$.
- (c) Using (b), list all possible selections of nonbasic variables. For each such selection, also list the basic variables and the corresponding basic solution $\mathbf{x} = (x_1, x_2, x_3, x_4)$ expressed using exact fractional coordinates.
- (d) For each \mathbf{x} found in (c), list whether it is a feasible or infeasible basic solution. Also identify the corresponding corner point A, B, C, ... from your graph in part (a).
- (e) By evaluating the objective function at the points \mathbf{x} , determine the optimal solution to the LP.

HINT: To determine the vectors \mathbf{x} in part (c) it is not necessary to use matrix inverses. Rather just solve the equations $A\mathbf{x} = \mathbf{b}$ using the specified values for the nonbasic variables.